OCR
Oxford Cambridge and RSA

F

Thursday 2 November 2017 – Afternoon

GCSE TWENTY FIRST CENTURY SCIENCE CHEMISTRY A/SCIENCE A

A171/01 Modules C1 C2 C3 (Foundation Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil ( ).
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Car engines make carbon dioxide.

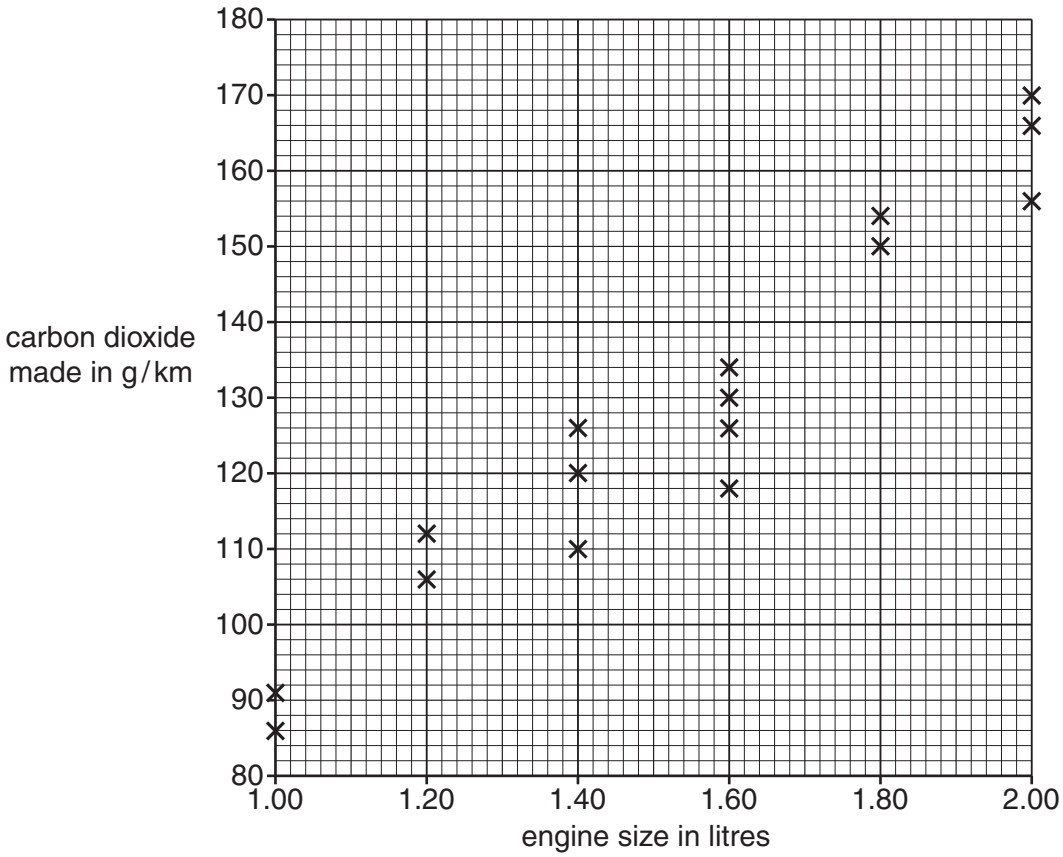
(a) Put a (ring) around **each** correct word to complete this sentence.

In a car engine, carbon atoms from the **air / fuel / water** react with

oxygen from the **air / fuel / water** to make carbon dioxide.

[2]

(b) The chart shows the carbon dioxide made by 16 different car engines when the car drives for 1 kilometre.
The mass of carbon dioxide made is plotted against the size of each car engine.



(i) Look at the chart.
Are the following statements **true** or **false**?
Put ticks (✓) in the correct boxes.

	true	**false**
The smallest amount of carbon dioxide made by any car is 86 g/km.	☐	☐
The range of carbon dioxide made by cars with a 1.4 litre engine is 118 to 134 g/km.	☐	☐

[1]

(ii) What is the trend shown by the chart?

.....

..... **[2]**

(c) Car engines add carbon dioxide to the air.
It does not stay in the air.

How is carbon dioxide removed from the air?
Put ticks (✓) in the boxes next to the **two** correct answers.

It dissolves in seawater. ☐

It is used in combustion. ☐

It settles on surfaces. ☐

It is used by animals in respiration. ☐

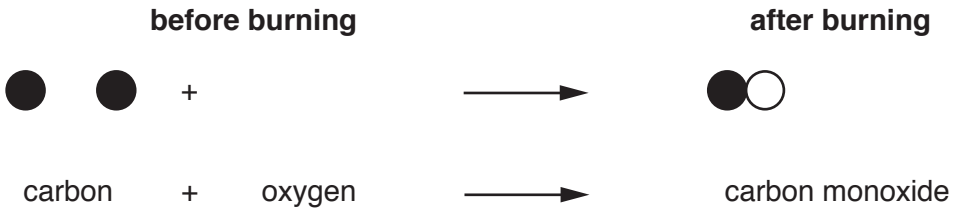
It is used when plants photosynthesise. ☐

[2]

[Total: 7]

2 People who go camping often cook on a barbecue.

(a) When charcoal burns in a barbecue some carbon monoxide is made.
Charcoal is mainly carbon.
Look at the diagram for this reaction.



Two molecules are missing from the diagram.

(i) Which molecule is missing **before burning**?
Put a ring around the correct molecule.

[1]

(ii) Which molecule is missing **after burning**?
Put a ring around the correct molecule.

[1]

(b) Read this notice.

DO NOT USE A BARBECUE INSIDE TENTS

DANGER CARBON MONOXIDE

(i) Why is carbon monoxide dangerous?
Explain your answer.

.....

.....

.....

..... **[2]**

(ii) The notice says 'Do not use a barbecue inside tents'.
Why does using the barbecue outdoors reduce the danger from carbon monoxide?

.....

.....

.....

..... **[2]**

[Total: 6]

3 **(a)** Catalytic converters lower air pollution.
They change:

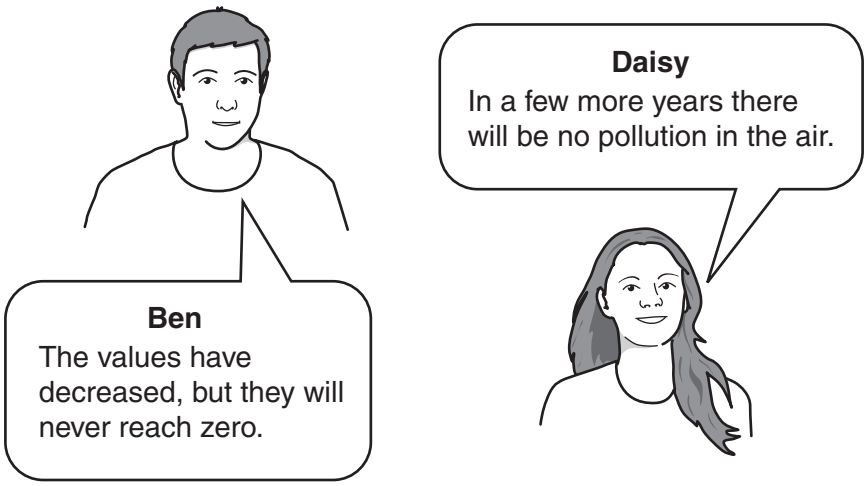
- carbon monoxide to carbon dioxide
- nitrogen oxides to nitrogen.

Daisy and Ben look at data about air pollutants in the UK.
The data shows the amounts of carbon monoxide and nitrogen oxides put into the air from **all sources** in 1993 and 2013.

All new cars have been fitted with catalytic converters since 1993.

	Amount of gas put into the air from all sources in tonnes	
	1993	**2013**
Carbon monoxide	1200	550
Nitrogen oxides	2500	1350

This is what Daisy and Ben say about the data.



What conclusions can you make from the data?
Look at what Daisy and Ben say. Who is correct and why?

The quality of written communication will be assessed in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

(b) Write down **one other** way to lower air pollution from cars and explain how it works.

.....

.....

.....

..... **[2]**

[Total: 8]

4 Fibres are used to make clothes.
The table shows the properties of some of these fibres.
For each property, the fibres are given a rating from poor to very good.

	Cotton	**Nylon**	**Silk**	**Wool**
Comfort	good	medium	very good	good
Heat insulation	good	poor	poor	very good
Stretch	medium	good	poor	medium
Water absorbance	very good	poor	medium	medium

(a) One of these fibres is not a natural fibre.
Which one?
Put a ring around the correct answer.

cotton **nylon** **silk** **wool**

[1]

(b) Look at the table.

(i) Which fibre would be the best choice for making a winter coat?
Put a ring around the correct answer.

cotton **nylon** **silk** **wool**

[1]

(ii) What property makes it the correct choice?
Put a ring around the correct answer.

comfort **heat insulation** **stretch** **water absorbance**

[1]

(c) Ian buys a T-shirt to wear for running.
He chooses a T-shirt made of cotton.
Is this the best choice? Use the table above to explain your answer.

.....

.....

.....

.....

.....

..... **[3]**

[Total: 6]

5 **(a)** These sentences are about crude oil.
Draw a straight line from the **beginning** of each sentence to the correct **ending**.
One has been done for you.

beginning	ending
Crude oil is found in	hydrocarbons.
Crude oil contains a mixture of	polymers.
Crude oil is refined to make	the Earth's crust.
Small molecules can be joined together to make	materials that make other chemicals.

[2]

(b) The table shows information about three molecules in crude oil.

Number of carbon atoms in molecule	Boiling point in °C	Forces between molecules
5	36	very weak
8	98	weak
17	300	strongest

Describe and explain why the boiling point changes with the size of molecules.
Use ideas about the forces between molecules in your answer.

.....

.....

.....

.....

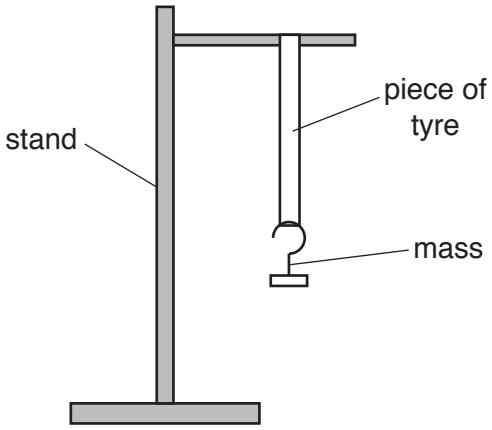
..... **[3]**

[Total: 5]

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

6 Three groups of students investigate how much a piece of bike tyre stretches.
They hang masses on the piece of tyre.
They increase the mass and measure the increase in length.



(a) Name **one** factor that must be controlled in this investigation.
Explain how this makes it a fair test.

.....

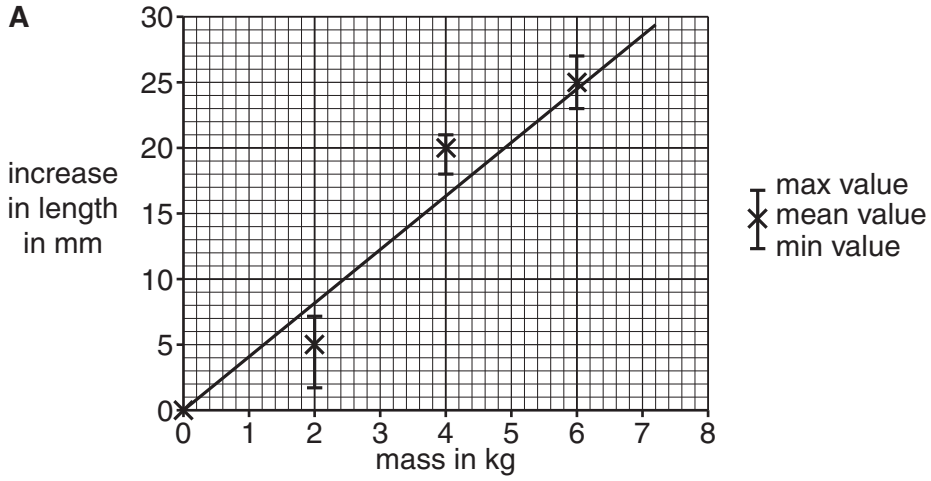
.....

.....

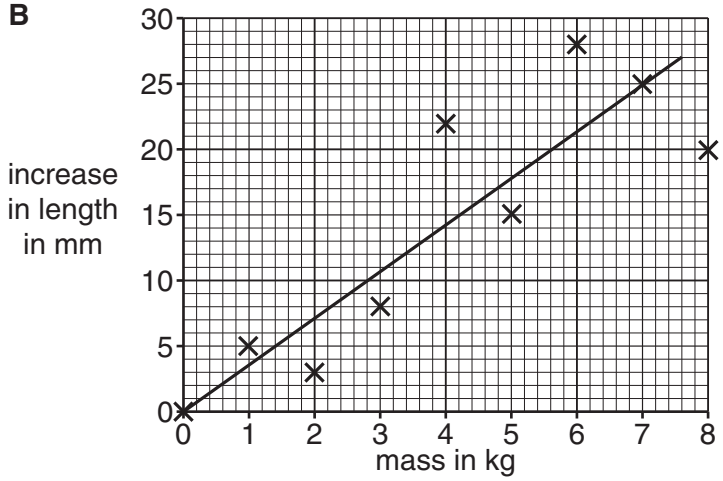
..... **[2]**

(b) The results from each group are plotted on graphs.
Here are the graphs from the three groups of students.

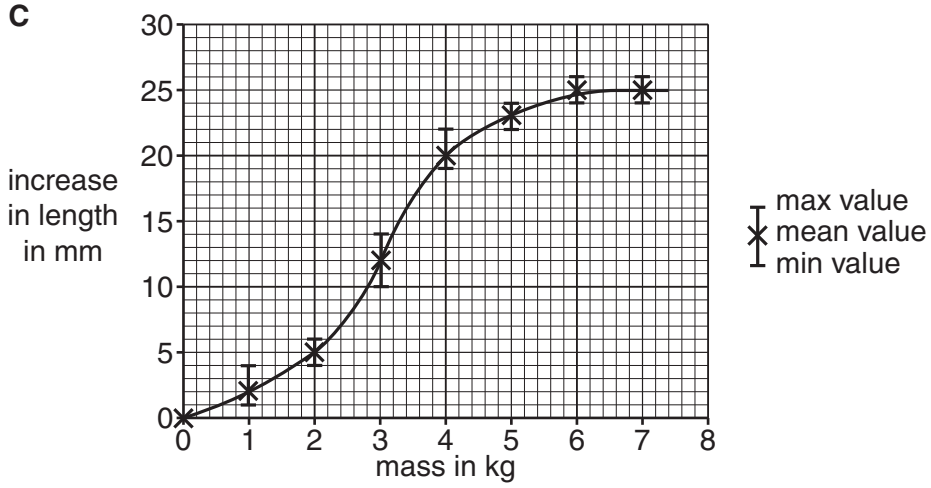
Group **A**



Group **B**



Group **C**



Group **C** have the best results. Explain why group **C**'s results are better than groups **A** and **B**. Use group **C**'s graph to write a conclusion for the investigation.

The quality of written communication will be assessed in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

[Total: 8]

7 Some scientists are looking at the Life Cycle Assessment (LCA) of two shirts made from two new fibres.
One shirt uses fibres made from bamboo. Bamboo grows faster than any other plant in the world.
The other shirt uses a polymer that is made from crude oil.

Here is data on the LCA of each shirt.

	Shirt made from bamboo fibre		**Shirt made from polymer fibre**	
	Energy in MJ	**Water use in litres**	**Energy in MJ**	**Water use in litres**
Making fibres from raw materials	5.6	35	6.0	15
Using the fibres to make the shirt	3.5	0	4.2	0
Washing the shirt after it has been worn	26.5	1560	26.5	1560
Disposing of the shirt	0.8	0	0.8	0
Other information	bamboo grows very quickly		polymer is made from crude oil	

Use the data in the table to answer these questions.

(a) The polymer shirt uses more energy over its lifetime.
How much **more** energy does it use than the bamboo shirt?
Show your working.

difference in energy used = ... MJ **[2]**

(b) **(i)** Which stage of the life cycle uses the most energy in both the shirts?

..... **[1]**

(ii) Suggest one way to lower the use of energy in this stage.

.....

..... **[1]**

(c) Is it better to make shirts from bamboo or from the polymer? Use the table on page 14 to explain the advantages and disadvantages of your choice.

The quality of written communication will be assessed in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

(d) What other data should be included in a Life Cycle Assessment?
Put ticks (✓) in the boxes next to the **two** correct answers.

The price of the shirt in the shops. ☐

The colour of the shirt. ☐

The air pollution made when making the shirts. ☐

The chemicals used during the lifetime of the shirt. ☐

The number of shirts made by the manufacturer. ☐

[2]

[Total: 12]

8 This question is about making and using alkalis.

(a) (i) What was used to **make** alkalis before industrialisation?

Put a tick (✓) in the box next to the correct answer.

burnt wood and stale urine ☐

rotting plants and animals ☐

sand and sea water ☐

crude oil ☐

[1]

(ii) How were alkalis **used** before industrialisation?

Put a tick (✓) in the box next to the correct answer.

to make water safe to drink ☐

as a fuel ☐

to neutralise soil ☐

to preserve food ☐

[1]

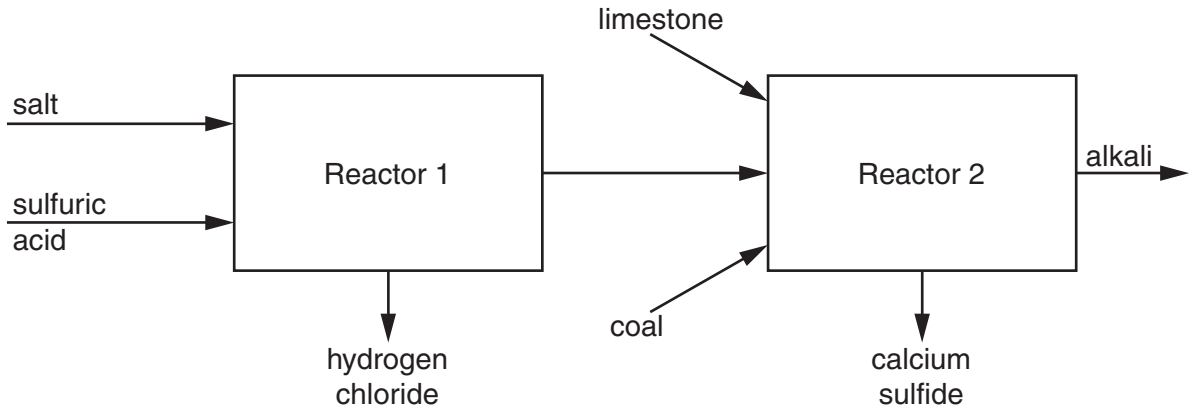
(b) (i) New ways of making alkalis had to be found after industrialisation. Explain why.

.....

.....

..... **[2]**

(ii) One way that alkali was made after industrialisation is shown in the diagram.



Salt and limestone are two of the raw materials used in this process.
What other **two** raw materials are used?

.....

..... **[2]**

(iii) Later, the process was changed.
The new process made chlorine instead of hydrogen chloride.
What were the advantages of making chlorine instead of hydrogen chloride?

.....

.....

.....

..... **[2]**

[Total: 8]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).